Internet and Intranet Calling with PVX™

An Application Note

October 18, 2004

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PVX™ is an advanced conferencing software application that delivers Polycom's premium quality audio, video, and content sharing to your PC and standard USB camera.

PVX brings unprecedented video conferencing technology to your desktop PC with the first software application ever offered by the industry leader. Using the industry's highest quality audio/video algorithms, PVX is the only PC application to offer both secure communications and People+Content**™.**

PVX supports most standard web cams, eliminating the need for a separate video camera. When used in conjunction with a laptop and portable USB camera, PVX provides the ultimate in portability.

This application note explains how to configure PVX for the broadband connection in your office, home office, or small business. Refer to this document for the system settings that will maximize video conferencing performance without compromising your network security.

Before You Begin

System Requirements

Please make sure that your PC meets the minimum system requirements listed in the following table. If your PC does not meet the requirements, you will not be able to make PVX calls.

NOTE: If you are running on a laptop PC, be sure to have the AC power plugged in before starting Windows to ensure the CPU is running in full power mode.

Table 1 System Requirements

Windows	Windows 2000 with Service Pack 4 or later Windows XP with Service Pack 1 or later
PC Processor	**Polycom ViaVideo and ViaVideo II camera** People Video only: • 800 MHz Intel® Pentium® III • Any Intel® Pentium 4 or Intel® Pentium M • 1800+ Athlon XP People+Content: • 1.2 GHz Intel® Pentium® 4 • 900 MHz Intel® Pentium M • 1800+ Athlon XP

	Web Cam with PC processing H.263 People Video only: • 1.0 GHz Intel® Pentium® 3 • 1.2 GHz Intel® Pentium® 4 • 900 MHz Intel® Pentium M • 1800+ Athlon XPH.264 People Video only: • 1.5 GHz Intel® Pentium® 4 • 1800+ Athlon XP People+Content: • 2.0 GHz Intel® Pentium® 4 • 1.4 GHz Intel® Pentium M • 2200+ Athlon XP (Polycom PVX requires a processor that supports the Intel SSE™processor extensions. SSE™ is not supported on the Pentium II family or Athlon CPUs prior to the Athlon XP.)
RAM	256 MB
Video Memory	8 MB
Hard Drive Space	60 MB available (for Polycom PVX software)
USB Camera supported	USB 1.x or 2.x web cam, ViaVideo, or ViaVideo II camera (camera is optional for view-only calls)
Speakers or Headset	• Headphones • Headset with microphone • Computer speakers (external or internal) • Speakers connected directly to ViaVideo
Monitor	SVGA (800 x 600) or higher resolution
Network Access	Broadband IP (64 kbps and above)
Microsoft® Internet Explorer	Version 6.0 or later
Windows Media®	Player Version 9.0 or later
Microsoft DirectX® Software	Version 9.0b or later Find out the current version on your computer using the DirectX Diagnostic Tool by clicking Start > Run and entering `dxdiag`. Download the latest update from http://www.microsoft.com/windows/Directx/.

Installing PVX

For instructions on installing PVX, see the software CD packaging. Also refer to the PVX Release Notes.

Activating Your PVX Software

When you start PVX, the application prompts you to activate your software. You can either enter the activation codes or simply click Continue if you prefer to use the evaluation version. The evaluation version allows you to make unlimited five minute conferences.

PVX will prompt you to activate your software every time it starts until a valid activation key is entered. If you would like to have a full version, please contact Polycom reseller or go to www.polycom.com to purchase PVX with an activation number.

Directory Setup

When you set up PVX, you can choose to register with the following services:

Global Directory Service (GDS) - Select **Register with this Server** if you want to call one another using the directory in PVX. GDS is a global address book that Polycom provides on the Internet.

Internet Locator Server (ILS) – Select **Register with this Server** if your company has an ILS. Enter the name or IP address or the server in the entry field. Obtain the name of the server from your company's network administrator. In addition to calling one another using the directory, you can also make calls using the DNS name (your computer name), IP address, or an H.323 extension by using a Gatekeeper.

Running the Setup Wizard

The first time you start PVX, a wizard guides you through the initial setup. This section provides additional information you will need on some of the wizard pages to enable calling on the following types of connections:

- Within an Intranet
- Within a Virtual Private Network (VPN)
- Through a DSL or cable modem (no router)
- Through a network router

Refer to the appropriate section for your particular connection.

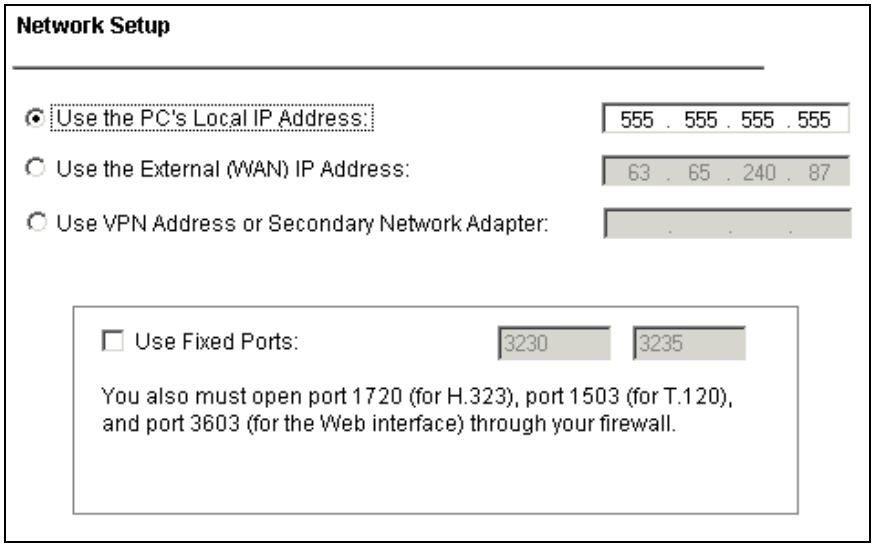
If you need to change your connection setup after you have finished the setup wizard, you can do so through the PVX application. For more information, refer to "Configuring Your Connection from the PVX Application" in this application note.

Setup for Calling Within an Intranet

Intranet calls remain inside the firewall, so you can communicate with anyone in your office network.

Enter this information in the setup wizard screens if you are setting up PVX for calling within your company network:

- **NAT Detected dialog box:** If the wizard asks whether to use the external WAN address, click **No**.
- Select **Use the PC's Local IP Address** to make Intranet calls.


Network Setup
Use the PC's Local IP Address:
555 . 555 . 555 . 555
Use the External (WAN) IP Address:
63 . 65 . 240 . 87
Use VPN Address or Secondary Network Adapter:
Use Fixed Ports:
3230
3235
You also must open port 1720 (for H.323), port 1503 (for T.120), and port 3603 (for the Web interface) through your firewall.

If you need to use PVX to make external calls outside of your Intranet, please check with your network administrator. Calls outside of your Intranet require changes in the firewall settings to allow video through specific ports. Network administrators oversee firewall configurations for enabling calls to and from the Internet.

Setup for Calling Within a Virtual Private Network (VPN)

VPN is a private network that uses the public network (the Internet) for secured communication. Many offices use a virtual private network (VPN) to connect multiple locations, such as home offices and remote branch offices. With a VPN connection, users have full access to their company network, whether they are located remotely or at the central offices.

Calls within your company VPN remain within the firewall, so you can communicate with anyone in your office network without configuring PVX for connecting externally to the Internet. This way, users can make calls using the directory and all other communication equipment they have in the office.

Calls outside of your VPN require changes in the firewall settings to allow video through specific ports. Please contact your network administrator.

Start your VPN client and establish a connection before starting PVX. Enter this information in the setup wizard screens:

- **NAT Detected dialog box:** If the wizard asks whether to use the external WAN address, click **No**.
- **Network Setup page:** Select **Use VPN or Secondary Network Adapter**.

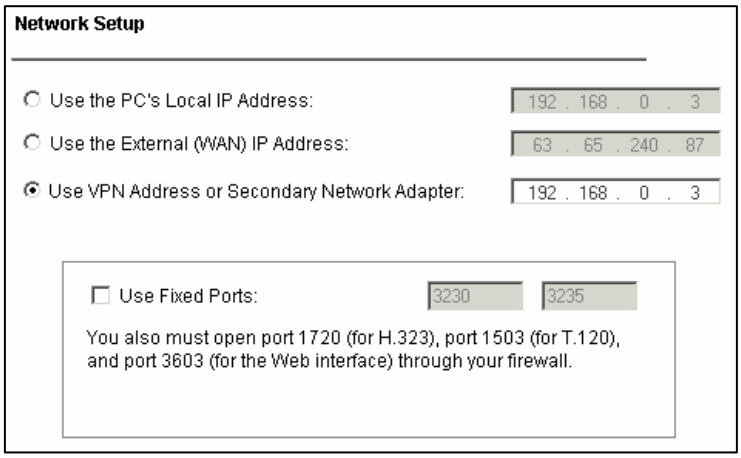

Network Setup
Use the PC's Local IP Address:
192 . 168 . 0 . 3
Use the External (WAN) IP Address:
63 . 65 . 240 . 87
Use VPN Address or Secondary Network Adapter:
192 . 168 . 0 . 3
Use Fixed Ports:
3230
3235
You also must open port 1720 (for H.323), port 1503 (for T.120), and port 3603 (for the Web interface) through your firewall.

Figure 2 PVX Network Setup for VPN

When you connect to your VPN, your company's network assigns you an address. This is different from the address assigned by your router. To make calls through your VPN, you must choose the VPN as your network adapter.

After you finish the wizard, start PVX and click **Setup** > **Network** to open the Network tab. Click the Address Setup button and select your VPN connection from the Designate Network Adapter list. Click **OK** in Address Setup box and **OK** in Network Setup.

If your VPN is not listed in the network adapter list, please refer to the user manual for your VPN client to find out how to get the address manually.

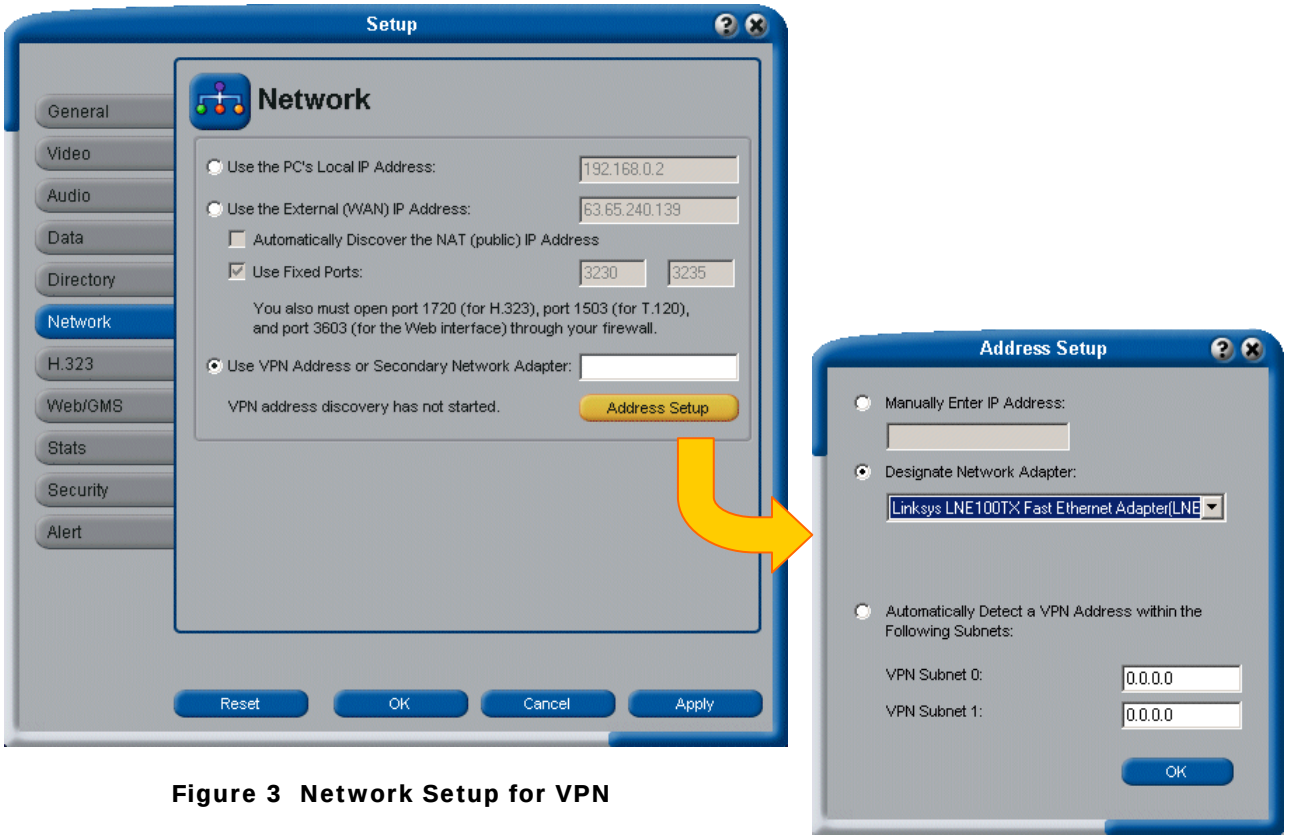


Figure 3 Network Setup for VPN

When you connect to your VPN, your company's network assigns you an address. This is different from the address assigned by your router. To make calls through your VPN, you must choose the VPN as your network adapter.

If your VPN is not listed in the network adapter list, please refer to the user manual for your VPN client to find out how to find the address.

Setup for Calling Through a DSL or Cable Modem

Use the following instructions for setting up PVX on a computer that accesses the Internet directly through a DSL or cable modem with no network router.

Calls across the public Internet typically pass through a firewall that protects the computer from unsolicited traffic from the outside. Computers connected directly to a broadband modem often use software-based firewall. If you have firewall software installed on your computer, you may need to disable or configure the software. See the Testing and Troubleshooting section of this document for more information.

Enter this information in the setup wizard screens:

- **NAT Detected dialog box:** If the wizard asks whether to use the external WAN address, click **No**.
- **Network Setup page:** Select **Use the PC's Local IP Address**.

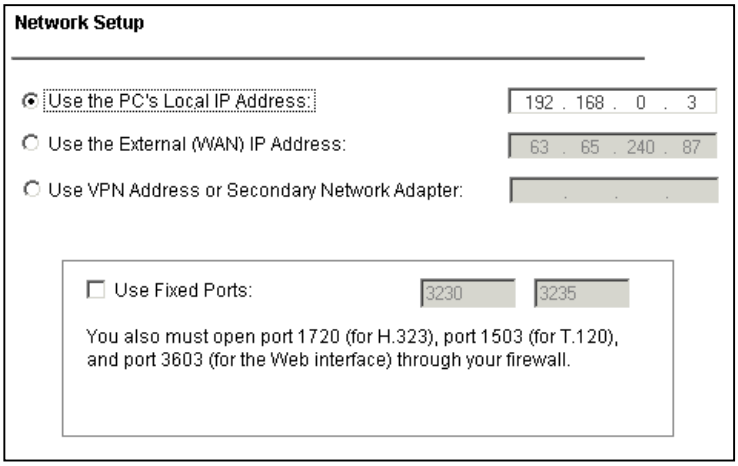

Network Setup
Use the PC's Local IP Address:
192 . 168 . 0 . 3
Use the External (WAN) IP Address:
63 . 65 . 240 . 87
Use VPN Address or Secondary Network Adapter:
Use Fixed Ports:
3230
3235
You also must open port 1720 (for H.323), port 1503 (for T.120), and port 3603 (for the Web interface) through your firewall.

Figure 4 PVX Network Setup for DSL or Cable Modem

Setup for Calling Through a Network Router

Network routers enable multiple computer resources to share a high-speed Internet connection such as Digital Subscriber Lines (DSL) or cable. Most routers for Small Office Home Office (SOHO) networks include a *firewall* to protect the network by controlling unsolicited traffic from outside the network.

To allow video conferencing traffic to pass in and out of your local network, you must open ports in the firewall or your router will block the request.

Routers also provide *Network Address Translation* (NAT). NAT uses private internal IP addresses for the devices within the network while using a single external IP address to communicate outside the network. NAT adds an extra level of security by effectively masking the internal network behind a single external IP address.

PVX supports video calls behind a firewall. In order to run PVX through a network router and firewall, you must open specific ports for video conferencing. You assign the open ports to the internal IP address (as defined by NAT) of the computer running PVX. This process is known as *port forwarding* or *pinholing*. This application note provides procedures for port forwarding on the most common routers.

If you have firewall software installed on your computer in addition to the router firewall, you may need to disable or configure the software. See the Testing and Troubleshooting section of this document for more information.

Enter this information in the setup wizard screens:

- **NAT Detected dialog box:** If the wizard asks whether to use the external WAN address, click **Yes**.
- Network Setup page: Select Use External (WAN) IP Address and select Use Fixed Ports (3230 and 3235).

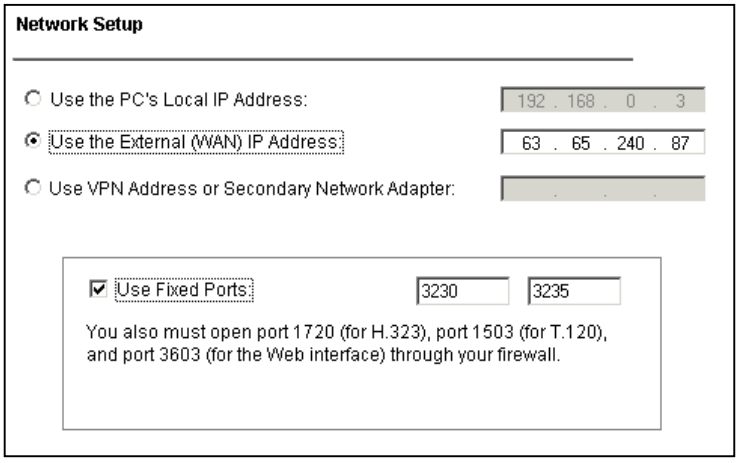

Network Setup
Use the PC's Local IP Address:
192 . 168 . 0 . 3
Use the External (WAN) IP Address:
63 . 65 . 240 . 87
Use VPN Address or Secondary Network Adapter:
Use Fixed Ports
3230
3235
You also must open port 1720 (for H.323), port 1503 (for T.120), and port 3603 (for the Web interface) through your firewall.

Figure 5 PVX Network Setup for Calling Through a Router

Verify that the External (WAN) IP Address is the correct number provided by your ISP. Most routers list the external IP address on a router status page. If you need to change the IP address, finish the wizard, start PVX, and click **Setup** > **Network** to open the Network tab. Enter the correct External (WAN) IP Address and click **OK**.

You must also configure your router before you can make calls with PVX. Please continue to the next section, Configure Router Port Forwarding.

Configure Router Port Forwarding

This section provides instructions for opening and assigning ports in the most common routers from NetGear, Linksys, and D-Link. Most other routers require similar procedures.

Before you can change your router configuration, you must have the following:

- The IP address of your router. Consult your router's user documentation for the IP address. (Note that many routers use the default address 192.168.0.1.)
- Your router's administrator name and password. Consult your router's user documentation for the user name and password. (Note that many routers use the default user name `admin` and password blank or `password`.)
- The IP address that the NAT has assigned to your computer.

To obtain the IP address that a NAT has assigned to a specific Windows XP computer, click Start > Settings > Network Connection > LAN and select the Support tab. The Details window shows the IP address. PVX also lists the local IP address in the main window.

With any router brand or model, you will open the ports listed in the following table.

Table 2 Router Ports to Open

PORT	FUNCTION	TCP or UDP
1720	H.323 Call setup	TCP
3230-3235	Signaling and control for audio, call, video and data/FECC	TCP and UDP
1503 (optional)	T.120 Data collaboration	TCP

NetGear Routers

The following procedure applies to NetGear MR814v2 and RP614v2 routers. The screens and settings may vary slightly for different NetGear models. The procedures assume that your router is correctly configured and connected to the Internet and that your network is operational.

To configure a NetGear router:

1. In a browser such as Internet Explorer, type the IP address of your router. Consult your NetGear user documentation for the IP address.

2. Log in to your router setup. Consult your NetGear user documentation for the user name and password.
3. From the Advanced menu on the left of the page, select Port Forwarding.
4. On the Port Forwarding page, select Add Custom Service.
5. On the Ports-Custom Services page, enter the following information for the first port in Table 2.

Service Name:	Any unique identifier such as the Function listed in Table 2.
Starting Point:	The Port listed in Table 2 or the starting value of the range listed in Table 2.
Ending Point:	The Port listed in Table 2 or the ending value of the range listed in Table 2.
Server IP Address:	The IP address that the NAT has assigned to your computer.

NetGear routers automatically pass TCP and UDP traffic through the same port. You do not have to designate TCP or UDP when you open ports.

6. Click Apply.
7. Repeat steps 4–6 of this procedure for the remaining ports in Table 2.
8. When you have opened and assigned all of the ports in Table 2, review the Port Forwarding page. Check that all of the ports are correct, enabled, and assigned to the correct Server IP (internal) Address.

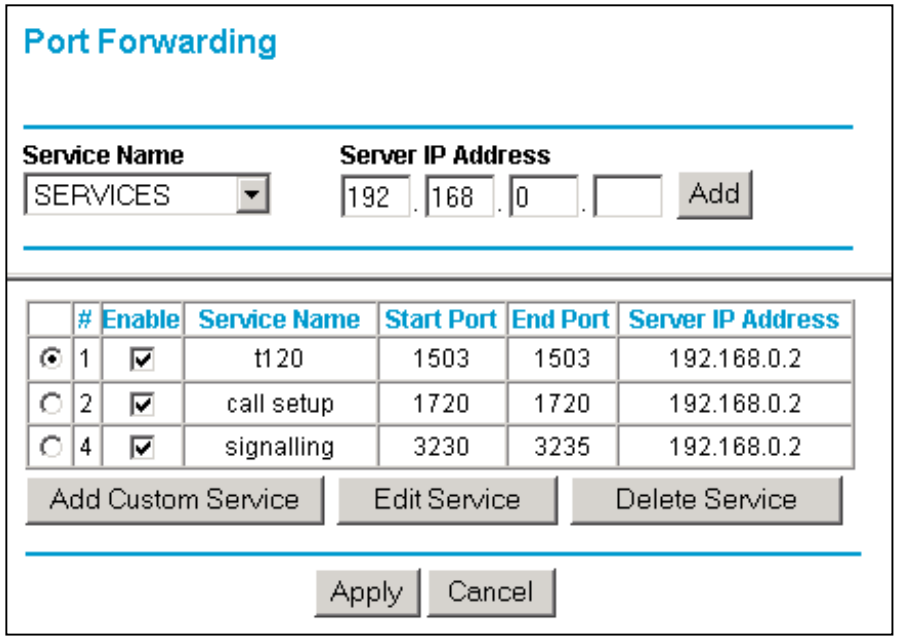


Figure 6 Port Forwarding on NetGear Router

Linksys Routers

The following procedure applies to the Linksys BEFSX41 router. The screens and settings may vary slightly for different Linksys models.

To configure a Linksys router:

1. In a browser such as Internet Explorer, type the IP address of your router. Consult your Linksys user documentation for the IP address.
2. Log in to your router setup. Consult your Linksys user documentation for the user name and password.
3. Locate the Port Range Forwarding page. (Depending on your router model, Port Range Forwarding may be listed in the Advanced or the Applications and Gaming menu.)
4. On the Port Range Forwarding page, enter the following information for the first port in Table 2.

Application	Any unique identifier such as the Function listed in Table 2.
Start	The Port listed in Table 2 or the starting value of the range listed in Table 2.
End	The Port listed in Table 2 or the ending value of the range listed in Table 2.
TCP/UDP	The selection listed in Table 2. Where Table 2 lists both TCP and UDP, enter the Application twice—once as TCP and once as UDP.
IP Address	The IP address (internal) that the NAT has assigned to your computer.
Enabled	Click this box.

5. Repeat step 4 of this procedure for the remaining ports in Table 2.
6. When you have opened and assigned all of the ports listed in Table 2, review the Port Range Forwarding list. Check that all of the ports are correct, enabled, and assigned to the correct IP (internal) Address as shown in the following figure.

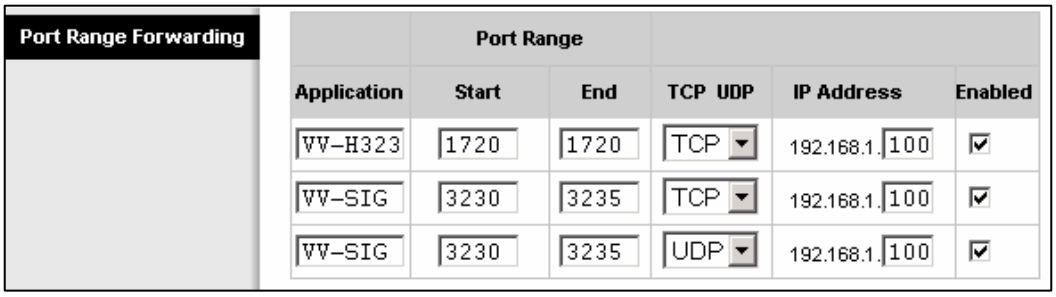


Figure 7 Port Range Forwarding on Linksys Router

D-Link Routers

The following procedure applies to the D-Link DI-604 router. The screens and settings may vary slightly for different D-Link models.

To configure a D-Link router:

1. In a browser such as Internet Explorer, type the IP address of your router. Consult your D-Link user documentation for the IP address.
2. Log in to your router setup. Consult your D-Link user documentation for the user name and password.
3. Select the Advanced tab.
4. Click the Firewall button.
5. On the Firewall page, enter the following information for each port in Table 2.

Enabled	Click this radio button.
Name	Any unique identifier such as the Function listed in Table 2.
Action	Select Allow.
Source	Interface: WAN
	IP Range Start: *
	IP Range End: (blank)
Destination	Interface: LAN
	IP Range Start: The IP address (internal) that the NAT has assigned to your computer.
	IP Range End: (blank)
	Protocol: TCP, UDP or * for both
	Port Range: The Port listed in Table 2 or the start and ending value of the range listed in Table 2.
Schedule	Always (or select a time for the port to be open).

6. When you have opened and assigned all of the ports listed in Table 2, review the Firewall Rules list. Check that all of the ports are correct, enabled, and assigned to the correct IP (internal) Address as shown in the following figure.

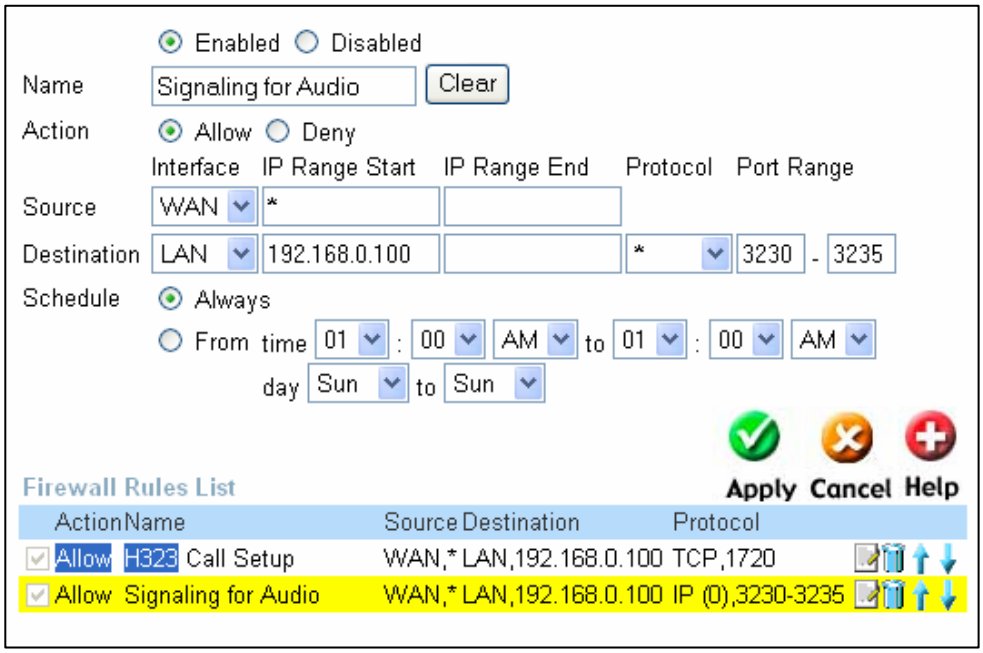


Figure 8 Firewall Rules on D-Link Router

Set up a DMZ

Some users may prefer to set up a PVX computer in a *demilitarized zone* (DMZ). A DMZ can be a quick way to configure PVX without opening specific ports individually.

DMZ is a firewall configuration that opens all of the ports through the router to a specific computer and places the computer outside of the firewall. Other devices within the network remain within the protection of the firewall. By isolating the computer with open ports, DMZ protects the rest of the network from exposure. If outside users penetrated the security of the DMZ computer, they could not gain access to any other computers on the network.

However, PVX requires only a limited number of open ports, so the advantage of opening all ports by running in a DMZ is minimal. If you choose to set up a DMZ, please refer to your router's user manual for instructions.

Configuring Your Connection from the PVX Application

If you need to change your connection settings after you finish the setup wizard, you can do so through the PVX application.

To change your connection settings:

1. In PVX, click **Setup** > **Network** to open the Network tab.
2. On the Network Setup page, configure the selections for your connection as follows.

If you are setting up this type of connection:	Do the following:
INTRANET	Select **Use PC's Local Address**. Click **Apply**.
VPN	Select **Use VPN Address or Secondary Network Adapter**** Click **Address Setup**. If you have already logged on to VPN, the Designate Network Adapter lists your VPN connection. Select your connection and click **OK**. Otherwise, select **Manually Enter IP Address** and enter the VPN address obtained from your VPN client. On the Setup page, click **Apply**.
DSL or CABLE MODEM	Select **Use PC's Local Address**. Click **Apply**.
NETWORK ROUTER	Select **Use the External (WAN) IP Address**. Enter your external (WAN) IP address. Your external IP address is the number provided by your ISP. Most routers list the external IP address on a router status page. Select **Use Fixed Ports** (3230 and 3235). Click **Apply**. Reboot your router.

Testing and Troubleshooting

Please refer to the PVX Release Notes for troubleshooting information including audio, video, camera, and calling issues.

If your call connects but users cannot view the incoming video (black screen), please follow these steps:

1. If you cannot see another user, verify that his or her camera is working.
2. If other users cannot see you, verify that your camera is working.
3. Verify that you have correctly followed the setup instructions.
4. Refer to this section for possible causes.

Software Firewalls

Many systems run software-only firewall packages from Microsoft or other products such as Zone Labs, Black Ice, Norton® Firewall, and McAfee® Firewall. Firewalls may interfere with video communications connection.

Windows XP

Users with the Windows XP operating system will not be able to place or receive video calls if the Internet Connection Firewall is enabled. To correct this:

1. Right-click My Network Connections.
2. Select Network Properties.
3. In Local Area Connection Properties, select Advanced.
4. Clear the Internet Connection Firewall option.

Users running Windows XP Service Pack 2 may experience difficulty establishing a connection to incoming calls through a firewall. If this occurs, do the following:

1. Click Start and then choose Settings > Control Panel.
2. Select Windows Firewall.
3. Select Exceptions.
4. Confirm the `vvsys.exe` and Windows NetMeeting check boxes are selected.

Zone Labs

If you are using the free downloadable version of Zone Labs firewall and virus protection, turn the software off while using PVX. If you are using other Zone Labs products, refer to the user documentation for blocking and unblocking ports.

Calling Speed and Bandwidth

Bandwidth rate is the connection speed, or the number of bits per second of data that can travel through a system or line. PVX is capable of up to 2 mbps. However, PVX requires 128 kbps minimum to connect a call.

It is important to note that high-speed DSL and cable services advertise bandwidth rates “up to” a specific speed. When a DSL or cable service claims connections up to 1.5 mbps, for example, this connection speed is a maximum and is not guaranteed.

Moreover, most ISPs do not provide *bi-directional* bandwidth, in which the upload rate is the same as the download rate. With most DSL and cable services, downloading is much faster than uploading. Downloading speed may be up to 1.5 mbps, but uploading speed is typically in the order of 384 kbps for DSL and 256 kbps for cable.

When you specify a dialing speed for PVX to use on your system, PVX uses the same specified rate for both upload and download. If any computer in the video conference cannot upload at the speed you specified, your calls may suffer from poor video quality or you may not be able to view video at all (black screen).

For best results, ask your Internet Service Provider for their *upstream* speed, or their guaranteed bandwidth rate for uploading. Start by setting the PVX dialing speed to the minimum rate claimed by your ISP and test your connection with faster settings.

To change your PVX call speed:

1. In PVX, click to open the Setup page.
2. Select H.323 from the menu on the left of the page.
3. On the H.323 page, select the Dynamic Bandwidth option to minimize the impact of bandwidth variation.
4. Click the call Speed button.
5. On the Select Speeds page, select a Default Call Rate that matches your ISP upstream speed (128 kbps recommended).

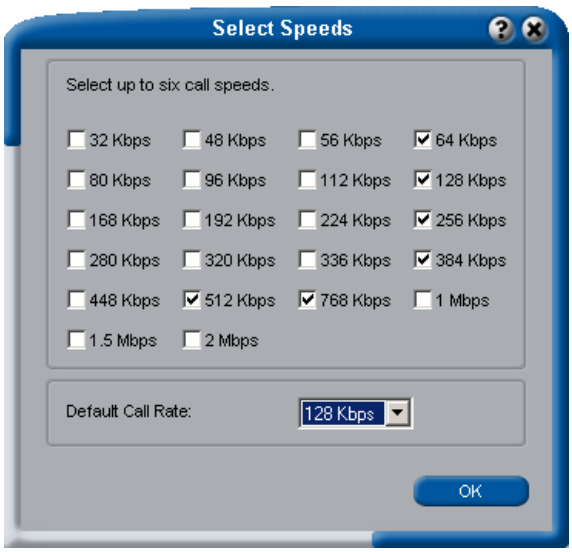


Figure 9 Setting Call Speed

Network Issues

If your router ports are forwarded correctly but you still cannot view video, try setting up your router and PVX in the following order:

1. Configure port forwarding on your router.
2. Configure the PVX network setup.
3. Reboot the router.
4. Start PVX.

PVX may not function properly if more than one network connection is used simultaneously.

Test Call

Polycom offers customers global access to a variety of video conferencing equipment. Feel free to utilize these numbers to conduct testing of your video conferencing units.

www.polycom.com/videotest

Uninstall PVX

If you need to uninstall PVX, insert the installation CD to start the installation wizard. From the Welcome page, select Remove.

Advanced Router Setup

The following ports are for advanced PVX features.

GMS Ports:

21 (FTP) – Software Updates & Provisioning
80 (HTTP) – Pulling ViewStation/VS4000 info
3601 (Proprietary) (Data Traffic) – GAB data
3603 - TCP – Pulling ViaVideo info (since might be non-web server PC)
389 - (LDAP and ILS)
1002 - (ILS)

GMS listens for connections on ports 80 and 3601 (GAB) and in the future will listen on port 3604 (ViaVideo) and other potentials later.

H.323 Ports:

80 - Static TCP - HTTP Interface (optional)
389 - Static TCP - ILS Registration (LDAP)
1503 - Static TCP - T.120
1718 - Static UDP - Gatekeeper discovery (Must be bidirectional)
1719 - Static UDP - Gatekeeper RAS (Must be bidirectional)

1024-65535 Dynamic TCP H245
1024-65535 Dynamic UDP - RTP (Video data)
1024-65535 Dynamic UDP - RTP (Audio data)
1024-65535 Dynamic UDP RTCP (Control Information)

3604 (GMS Server Discovery)(Used by ViaVideo)(Broadcast)

Accord (Polycom Network Systems) Additional Ports:

5001 – Static TCP – MGC Manager (5003 can be chosen instead within MGC)
21 – Static TCP – FTP (retrieve MGC config. Files etc.)

RADVision Additional:

1820 - Gateway Signaling/Call Setup
2720 - MCU Signaling/Call Setup